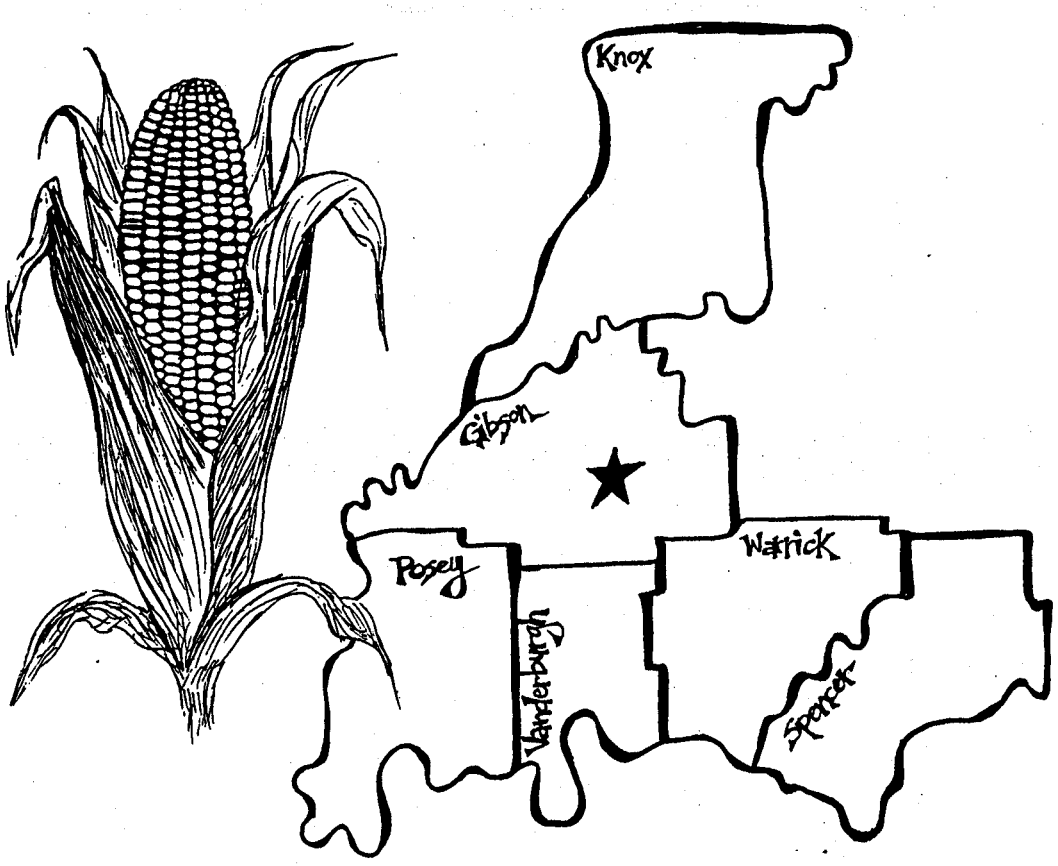
Value Added Crops
in
Southwestern Indiana



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A. Introduction

Growing the highest quality food corn is a proud tradition in Southwest Indiana. Farmers in Gibson, Knox, Posey, Spencer, Warrick and Vanderburgh Counties have successfully grown white corn for decades, producing it more consistently than any other area of the country.

According to a recent market survey, 20% of the farmers have grown white corn at some time; another 22% have grown yellow food corn. Many of the respondents—15% and 41% respectively—were very interested or somewhat interested in growing food corn in the future.

What's more, the 1,000,000 acres available

* Low mycotoxin incidence
* Consistent corn test weights of 58-60 pounds per bushel
* Excellent ear/pod/grain fill
* Support from Purdue University and the Indiana Commissioner of Agriculture.

But successful value added grain production requires more than high quality grain. Also needed are a strong workforce, a solid infrastructure, and a manifested desire to attract quality industry to the region.

The number one concern for a site selection is the labor force. According to the 1992 Census of Manufacturers, the Southwest Indiana workforce has a Value Added per Hour Worked of $72.63. Compare this to $56.23 for Indiana as a whole and $60.46 for

intrastate shipping to and from the area. Just-in-time delivery is available to all points within a 500-mile radius.

Located at the southern doorstep of the region, the Ohio River carries more freight tonnage than any other inland body of water in the world, and by 2005 a modernization program will make it the most cost-effective waterway on earth. This major water system rarely freezes and offers year-around economical, efficient access to national and international markets. Southwind Maritime Centre, an Ohio River port in Posey County, handled 4.3 million tons of cargo in 1995 and is a designated Foreign Trade Zone. Five barge lines and two barge terminals serve the region.

Three railroad systems serve the region. These include CSX Transportation, Norfolk Southern Corp., and Indiana Hi-Rail. The region has facilities for intermodel shipping, including containerization and piggyback, and for trans-shipment of goods between railroad cars and trucks to river barges.

The Evansville Regional Airport is located seven miles northwest of the city's business district, an hour or less from any point in Southwest Indiana. Offering more than 40 flights daily, jets and commuter planes provide direct service to many midwestern cities, and elsewhere for connecting flights. Two private charter services and aircraft maintenance service operate from the airport. The airport has a designated Foreign Trade Zone.

business to our area. See later in this publication for Economic Development Contacts for Southwest Indiana.

B Background and History

Performance trials and laboratory evaluations of value added crops for the past several years from southwestern Indiana plots are available. Coordinated through Purdue University, the Gibson County Plot Committee partners with local seed corn companies to provide the Gibson County Specialty Corn Plot. The plot contains food corn and high oil corn varieties common to the area.

The Schnur Plot located in Warrick County contains food corn, regular corn and soybeans. Area seed companies are invited to participate in this 30-year-old plot program.

Azteca Milling Company uses plots on selected farms to provide a basis for placing new varieties on their approved list. Companies are selected and invited to participate.

Southwestern Indiana farmers have marketed value added crops for years along the fertile plains of the Ohio and Wabash Rivers. Historically, producers have produced quality white corn exported to dry millers in the Caribbean, Mexico, and Japan. Domestic food corn processors use southwestern Indiana corn to produce traditional southern dishes, snack foods,

modified organisms (GMO), Azteca Milling L.P. switched to all white corn this year. Yellow food corn varieties are not contracted at this time, as the risk is too great for GMO contamination from current yellow corn variety offering. The company purchases 7.0 million bushels of quality white corn annually using producer contracts to meet annual production needs. Farmers cooperate with Azteca Milling L.P. to grow test plots to provide data for varieties on the approved variety list for each growing season.

C. Gibson County Plot Committee

Southwestern Indiana Purdue University Extension Educators extended an invitation to area food corn producers to assist with a specialty corn advisory committee.

Large food corn farmers were reluctant to share production and marketing concepts due to perceived limited demand by processors. The large acreage food corn producers were accustomed to marketing to niche opportunities using Ohio River barges. The custom was to plant vast acres of white corn and harvest without emphasis on quality factors. Much of the corn was sold to oversea dry millers.

Members of the Food Corn Advisory Committee requested an up-to-date database on quality and quantity measurements of white and yellow food corn varieties sold and produced in southwestern Indiana. Agriculture Statistics had not gathered data

companies to develop the first white corn plot in 1995. This was a strip plot developed with 41 white corn entries from 23 seed corn companies.

Seed corn reps, agri-business firms, and supporting grain buyers have input as voting members of the Gibson County Plot Committee. The Committee decides plot designs, field day programs and special programs. The Committee at the Annual Meeting elects a treasurer in January. The treasurer writes checks, keeps accounts and signs grant applications.

Funding for plot expenses are funded through a $45.00 per variety plot entry fee and grant monies. Indiana Value Added grants from the Office of Commissioner of Agriculture were received in 1996 - $43,395, 1997 – $11,100, 1998 - $6,990, 1999 - $14,320, and 2000 - $12,000.

Initially, Specialty Corn Field Days were held in late August at the plot site. In 1995 the site was the Kent Lamey farm near Haubstadt, IN and the following year was BMR Farms in Princeton, IN. Thereafter, the theme was changed to Value Added Grain Seminars with the time set in late November. This allowed time to tabulate plot data and to bring specialty grain experts to the seminar. Speakers have included Orville O. Fisher - white corn marketing specialist, Orion Samuelson – WGN farm announcer, and Vic Lechtenberg – Dean of Agriculture, Purdue University.

include the GMO issue, marketing and international demand for specialty grains.

The programs are coordinated through support from Purdue Cooperative Extension Service Agriculture Educators in Gibson, Posey, Spencer and Warrick Counties. Terry L Keeneth, Gibson County Agriculture Educator, acts as the coordinator for the Committee. Correspondence and entry procedures are handled from the Gibson County Extension office in Princeton, IN. Plot data is available on the web at: http://www.ces.purdue.edu/warrick/ag/plots

D. Warrick County Plot Protocol

Bill and Joe Schnur initiated the Warrick County Plot with support of the Purdue Cooperative Extension Service in the late 1960's. Mike Schnur is the current coordinator of the plot activities.

The plot has raised corn for thirty plus years and soybeans for thirteen years in conventional tilled soils. With assistance from the Monsanto Company, the plots are replicated five times using two rows, each twenty feet long. Since 1996, grain composition data has been collected.

The Warrick County Coop provides an early morning breakfast during the third Thursday of September each fall. Plot results are distributed and speakers analyze current grain market outlook to more than 200 attending farmers.

Plot data is available on the web at: http://www.ces.purdue.edu/warrick/ag/plots

E. Spencer County Plot Protocol

The Spencer County Soybean Cyst Nematode plot was started in 1990 as a strip plot with a check variety between each variety. In 1998, Dr. Chuck Mansfield, Purdue University Agronomist and Phillip Schmidt, Extension Educator, were able to plant the plot in a replicated block design. This allows more data from a small area. In 2000, the harvested soybeans were sent to Purdue University for composition analysis.

Soybean cyst nematode has been a problem in Spencer County for 30 years. It is estimated yield losses of 15-30% are not uncommon in the county due to the cyst. Spencer County supports 60,000 acres of soybeans each year. At least 75% of the soybeans planted in the county are cyst nematode tolerant or resistant. The plot provides yield data on 40 plus varieties. Soil samples are taken two weeks after planting and post-harvest to determine cyst population changes and variety effect on cyst levels.

Wheat trials have been conducted since 1998. Replicated wheat began with the 2000 crop. Correspondence and entry procedures are handled from the Spencer County Extension office in Rockport, IN. Plot data is available on the web at: http://www.ces.purdue.edu/warrick/ag/plots

committee is to provide useful yield and agronomic information regarding hybrids currently available in the Posey County area for use by producers. Currently, each company is restricted to only two hybrids in each plot.

The corn test plot is replicated 4 times, with the average yield, moisture, and test weight published for area producers to use in making hybrid decisions for the following year.

The soybean and wheat plots are planted in strip plots with a check variety (one particular hybrid), entered at set intervals throughout the plot. At harvest, the yield of each variety is compared to the average yield of the two checks on either side of it. This plus or minus number is then used to adjust the actual yield of the hybrid to what we call the adjusted yield. This helps to account for the variability in soil types, typography, etc… that may occur in the field.

Contact person for the Posey County plot is Jon Neufelder, Posey County Agriculture Educator, located at Mt Vernon, IN.
Plot data is available on the web at:
http://www.ces.purdue.edu/warrick/ag/plots

G. Azteca Milling L.P. Plot Protocol

The company has conducted strip variety tests with cooperating farmers since 1995. The goal is to learn more about varieties raised in southwestern Indiana before they want to be nominated for the first phase of testing. *If a company who wants to submit a hybrid is not sent an entry nomination please call 1-888-214-2233 ext. 421

When the seed is received, it will be stored at the corn lab until planting. The producer performing the test plot will determine the date that the seed will be planted. The producers will be selected depending on their field availability.

Before harvest, agronomic evaluations of the hybrid entries in the small plots in the hybrid-testing program should be made. At harvest, test plots should be evaluated for agronomic information including yield, moisture and test weight. Grain samples of approximately four pounds will be collected for grain quality evaluations for each entry in each test at harvest.

Approximately two-pound grain sample from all entries are sent to DITSA in Monterey, Mexico. If Corn Operations Manager feels more testing should be done samples will be sent to an external lab for testing. The rest of the sample of each hybrid has to be kept at the corn lab after being properly identified.

Based on the grain quality evaluations from DITSA, and information obtained, up to seven entries are selected for the second phase of testing.

PHASE TWO, SECOND YEAR TESTING

Quality evaluations are made on the masa and flour for each specific hybrid according to AMLP's flour specifications.

Hybrids meeting the quality parameters for making product are candidates for addition to the Approved Hybrids List. For information contact Santos Gallegos or Amy Allen at the Evansville Plant at (888) 214-2233.

H. Azteca Milling L.P.
Approved Hybrid List for 2001

SW Indiana & SE Illinois
Food Corn Hybrid List
2001 Crop

White Corn

AgriGold	6680
Pioneer	32K72
Pioneer	32H39
Pioneer	34p93
Stewarts	S703W
Vineyard	V449W
Vineyard	V453W
Vineyard	V433W
Whisnand	51AW
Zimmerman	Z62

Growers should carefully investigate the

I. Laboratory & Sampling Protocol of Gibson County and other Plots

Members of the Gibson Southern High School FFA Chapter complete sampling prior to harvest. The fifth reps are collected as whole ear samples and placed into a cloth bag. The samples are forwarded to the Purdue University Grain Analysis Laboratory at W. Lafayette, IN. The ears are shelled and dried before testing. All samples are placed in a near infrared transmittance analyzer (NIRT) to measure values for moisture, protein, oil, starch, and density.

Samples are sent to Texas A&M University for a pericarp removal test. The results are reported on a scale of 1 to 5 with 1 representing complete pericarp removal and 5 no removal of the pericarp.

At harvest, test weight, moisture, and yield data is collected. Plots are rated for stand ability ahead of the combine. All harvest data is converted to bushels based on 14.5% grain moisture. Economic ranking of varieties is based on current base pricing and docks for moisture, damage and oil content (high oil corn) received at the river terminal in Evansville, IN.

For other area plots, samples of grain are placed into a cloth bag and are forwarded to the Purdue University Grain Analysis Laboratory at W. Lafayette, IN. Corn ears are shelled and dried before testing. All samples are placed in a near infrared

J. 1999 Corn Composition Data

Dirk E. Maier, Jason Reising, Agricultural & Biological Engineering;

Ralph W. Gann, Indiana Agricultural Statistics Service

This fact sheet summarizes the composition data compiled for corn samples collected in Indiana during the 1999 harvest. District results are presented and composition data from the 1995, 1996, 1997, and 1998 crop years are compared.

Methodology

Whole ear corn samples were taken directly from the field as part of a multi-year survey conducted by the Purdue University Botany and Plant Pathology Department. The Indiana Agricultural Statistics Service in West Lafayette conducted the sampling. Samples were analyzed for fungal damage, and mycotoxin levels were quantified. Each ear corn sample consisted of 5-10 ears, which were placed in cotton bags. After the disease analysis, each bag of ears was dried with forced air and subsequently shelled using a stationary sheller. After shelling, the whole kernels were analyzed for moisture, protein, oil, starch, and density using a near-infrared transmittance (NIRT) whole grain analyzer (Infratech 1229) at the Purdue University Grain Quality Laboratory in the Department of Agricultural and Biological Engineering. All results are reported on a 15% moisture content basis (wet).

A total of 299 samples were available for

decreased again this year by 18,000 bushels per sample from the 1998 all time low due to decreased production statewide in 1999.

Results

The overall state protein increased 1.3 percentage points to 7.8% (Table B) from the 1998 average. This value is very close to the state averages for the years 1995-1997. The spread between the minimum and maximum protein contents increased to 10.5 points, an increase of more than 1.5 times compared to the 1998 spread, which was 6.3 points. The 1999 spread are the largest to date, showing more variability in the samples received since 1997, which were 7.4 points and spreads of 5.4 and 4.0 for 1996 and 1995 respectively.

Generally, protein content is negatively correlated to starch content, however, the measured starch content provided in the following tables may not equal the extractable starch content available to processors. While the protein average increased in 1999, the starch content decreased 1.3 percentage points to 62.8% (Table B). Starch ranges increased for the fourth straight year to 10.7 points, up from 10.0 points in 1998 and 9.6, 6.2, and 4.9 points for 1997, 1996, and 1995 respectively. Thus, the 1999 corn crop was more variable in its major constituents than in previous years. This increased variability may reflect an increase in the types of corn grown for niche markets by Indiana farmers. The average oil content increased 0.1

The results in Table B only give an indication of the composition values of corn across Indiana. Conditions during the growing season, hybrid selection, and soil fertility significantly affect intrinsic values such as protein, oil, starch, and density. Producers need to have their own samples analyzed to get more precise values.

Analysis

A statistical analysis was performed on the data collected from the last four years using Statistical Analysis Software (SAS) to uncover differences between years and between districts within a year. All tests used an alpha of 0.05. District summary values for 1996, 1997, and 1998 can be found in Grain Quality Fact Sheets 32, 37, and 40, respectively. The results of the analysis can be found in Tables C and D. In Table C, for each compositional component the years with the same letter are statistically similar, while in Table D, the districts with the same letter are similar within the year.

Yearly trends are apparent in the analysis of the data, showing that 1998 was the only year in which the statewide protein content average was statistically different than the other years (Table C). In 1996, the NE and SE districts were similarly low in protein compared to all other districts (Table D). In 1997 and 1999, all districts were statistically similar in protein, while in 1998 the SC district was higher in protein compared to all other districts. The SW and WC districts had consistently higher protein averages. In the

average at 6.6% in 1996, while the EC district had the lowest averages for 1997 and 1998 with 6.9 and 6.0%, respectively. The SE district had the second lowest averages in all three years with 6.6, 7.4, and 6.0% protein respectively. However, in 1999 the SE district had a 8.2% protein average, state's second highest.

Oil contents were fairly consistent across the last four years with only 1998 being significantly different (Table C). In 1996 and 1998, all districts were similar in oil, while in 1997 the SC district was statistically higher in oil compared to all other districts (Table D). In 1999, the NW district was significantly higher while the SW district was lower compared to all of the other districts. The SE district had the highest oil content average at 3.4% in 1996, but had the lowest average in 1997 (3.1%) and was tied for the lowest in 1999 with a 3.3 average. The SC district had the highest averages in both 1997 and 1998, 4.3% and 3.4% respectively. The NC district had the second highest average in 1996 with 3.4%, while the WC district was second for both 1997 and 1998 and ranked fourth in 1999 with averages of 3.5, 3.4,and 3.3% respectively. The NW district had the highest average in 1999, averaging 3.6%. The NE district had the lowest average in 1996 with 3.1% while the SW district had the lowest in 1998 and 1999 with 2.9% and 3.1% average respectively.

Starch content has been statistically different in each of the last four years, with 1998

other districts. The SE district was in the top three districts in overall starch content average three out of four years. In 1996, the NE district had the highest average with 62.2%, followed by the SE and SC districts (61.6%, and 61.4% respectively). EC district had the highest average in 1997; with SE district second (62.4%) and the NE district third with a 62.1% average. The SE district had the highest average of 64.5% in 1998, while the EC and C districts were second and third respectively (64.4% and 64.3%). The SW district had the highest average at 63.7% in 1999, while the WC and C districts were second highest with a 62.9% average. The WC district had one of the two lowest averages in three out of four years of the survey. The WC district had the lowest average in 1996 (60.9%), and second lowest in 1997 and 1998 with a 61.5% and 63.6% average, respectively. The C district had the third lowest average in 1996 and 1997 with 61.1% and 61.9%, respectively. The NC district had the lowest average at 62.2% in 1999, followed by the EC and SE districts, which averaged 62.3%.

Two of the years, 1997 and 1998, were statistically similar with regards to density, while 1999 had the highest average and 1996 had the lowest (Table 3). In 1996 and 1997, all districts were similar in density values, while in 1998 the SW district was significantly higher and the WC, EC, and SE districts were lower compared to all other districts (Table D). The NC district was significantly higher in density while the NW and SC districts had significantly lower values in 1999. The SW district was in the top three districts in three out of four years, being third in 1996 (1.276 g/ml), second in 1997 (1.308 g/ml) and had the highest average in 1998 (1.315 g/ml). The NC district had the third highest average in 1997, the second highest average in 1998 and the highest average in 1999 (1.306, 1.305, and 1.336 g/ml respectively). The SE district was in the bottom three each of the four years. It had the lowest in 1996 and 1998 with averages 1.251 and 1.289 g/ml respectively. In 1997, the SE district had the second lowest average with 1.286 g/ml and in 1999 had the third lowest average (1.316 g/ml).

See the following pages for appropriate table.

For further information, call (765) 494-2285, or send e-mail to grainlab@ecn.purdue.edu, or visit us on the World Wide Web at http://pasture.ecn.purdue.edu/~grainlab, where data from a number of county test plots are summarized.

Table A. Summary of the 1999 Indiana corn acres, yields, and production.

District	Harvested Acres (1000's)	Acres per Samples	Yield (Bu/ac)	Production (1000 Bu)	Production (1000 Bu) per Sample
NW	910	22,195	136	123,767	3,019
NC	765	20,132	117	89,510	2,356
NE	565	29,737	116	65,544	3,450
WC	715	17,439	132	94,385	2,302
C	1,250	18,657	142	177,509	2,649
EC	450	14,516	138	62,103	2,003
SW	**730**	**17,381**	**129**	**94,175**	**2,242**
SC	185	23,125	109	20,166	2,521
SE	180	15,000	113	20,341	1,695
State	5,750	19,231	130	747,500	2,500
1998	5,500	18,377	134	760,350	2,518
1997	5,850	36,792	123	719,550	4,525
1996	5,600	26,794	123	670,350	3,207
1995	5,400	35,762	113	598,900	3,966

Table B. Summary of 1999 Indiana Corn Composition Survey
(15% moisture basis)

District	Number Samples	% Protein		% Oil		% Starch		Density (g/ml)	
		Avg.	Range	Avg.	Range	Avg.	Range		
NW	41	7.4	6.5-9.5	3.6	2.6-7.1	62.6	57.2-65.7	1.308	1.247-1.382
NC	38	8.3	5.5-12.0	3.4	2.7-4.4	62.2	57.2-65.1	1.336	1.269-1.385
NE	19	8.0	6.5-10.5	3.3	2.9-3.8	62.7	60.3-64.1	1.317	1.294-1.343
WC	41	7.8	5.2-10.7	3.3	2.4-4.4	62.9	59.6-65.2	1.327	1.283-1.379
C	67	7.7	4.9-10.3	3.3	2.4-4.3	62.9	59.6-65.2	1.327	1.278-1.391
EC	31	8.3	6.3-15.1	3.3	2.4-4.0	62.3	55.4-65.4	1.320	1.277-1.356
SW	**42**	**7.1**	**4.6-9.3**	**3.1**	**2.4-3.9**	**63.7**	**58.2-66.1**	**1.318**	**1.252-1.367**

Table C. Statistical Analysis Across Years				
Year	**Protein**	**Oil**	**Starch**	**Density**
1996	A	A	D	C
1997	A	A	C	B
1998	B	B	A	B
1999	A	A	B	A

Table D Statistical Analysis Across Districts Within a Year – Corn								
District	**Protein Average**		**Oil Average**		**Starch Average**		**Density Average**	
1996								
NW	A	7.5	A	3.4	A,B	61.2	A	1.267
NC	A	7.9	A	3.4	B	61.0	A	1.272
NE	A	6.6	A	3.1	A	62.2	A	1.257
WC	A	8.2	A	3.3	B	60.9	A	1.261
C	A	8.0	A	3.3	A,B	61.1	A	1.273
EC	A	7.8	A	3.3	A,B	61.2	A	1.276
SW	**A**	**7.9**	**A**	**3.3**	**A,B**	**61.1**	**A**	**1.276**
SC	A	7.6	A	3.4	A,B	61.5	A	1.281
SE	B	6.6	A	3.4	A	61.7	A	1.253
1997								
NW	A	7.8	A	3.4	A	61.9	A	1.309
NC	A	8.0	A	3.1	A	62.0	A	1.306
NE	A	7.3	A	3.4	A	62.1	A	1.286
WC	A	8.2	A	3.5	A	61.5	A	1.294
C	A	7.8	A	3.3	A	61.9	A	1.306
EC	A	6.9	A	3.3	A	62.7	A	1.301
SW	**A**	**8.2**	**A**	**3.2**	**A**	**61.38**	**A**	**1.306**
SC	A	8.1	B	4.3	A	60.4	A	1.289
SE	A	7.4	A	3.1	A	62.4	A	1.286
1998								
NW	A	6.6	A	3.1	A	64.2	A,B	1.302
NC	A	6.7	A	3.1	A	64.1	A,B	1.305
NE	A	6.6	A	3.1	A	64.0	A,B	1.304
WC	A	6.7	A	3.4	A	63.6	B	1.290
C	A	6.1	A	3.2	A	64.4	A,B	1.296
EC	A	6.0	A	3.1	A	64.4	B	1.296
SW	**A**	**6.9**	**A**	**3.0**	**A**	**64.1**	**A**	**1.315**
SC	B	7.8	A	3.4	B	62.6	A,B	1.296
SE	A	6.0	A	3.1	A	64.5	B	1.289

K. 1999 Soybean Composition Data

Dirk E. Maier, Jason Reising, Agricultural & Biological Engineering;

Ralph W. Gann, Indiana Agricultural Statistics Service

This fact sheet summarizes the composition data compiled for corn samples collected in Indiana during the 1999 harvest. District results are presented and composition data from the 1995, 1996, 1997, and 1998 crop years are compared.

Methodology

Soybean samples were taken directly from the field as part of the annual yield survey conducted by the Indiana Agricultural Statistics Service. All samples were analyzed for moisture, protein, oil, and fiber using a near-infrared transmittance (NIRT) whole grain analyzer (Infratech 1229) available at the Purdue University Grain Quality Laboratory in the Department of Agricultural and Biological Engineering. All results are reported based on a 13% moisture basis (wet).

There were 24 samples available for compositional analysis from six districts. The SW, SC, and SE districts were not represented. Given the number of samples from each crop-reporting district, all of the districts were under-represented based on the total acres harvested per sample (Table E). This was again an increase compared to 1997 and 1998. It is hoped that in the future

from the previous year, which ended a three-year trend of increasing protein values. The spread between the minimum and maximum protein values decreased for the second straight year to 5.0 points, down from the 1998 low of 5.5 points. In previous years the spread had been 11.6 points (1996) and 11.2 points (1997). Average oil content increased for the fourth straight year to 18.7%, a 0.5-point increase, up from the 18.2% average in 1998, 17.7% in 1997 and 17.3% in 1996. The spread between the range of oil values was 4.2 points, one and a half times more than the 1998 spread, but consistent with the 1996 and 1997 spreads of 4.4 and 4.3 respectively. Average fiber content remained unchanged from 1998 at 5.3%, which is higher than 1997 by 0.2 points, but still lower than the 1996 high of 5.6%. The spread between the ranges of fiber values was 1.1 points, an increase of 0.3 points compared to 1998 and 0.2 points compared to 1996 and 1997.

An increase in both protein and oil, and a decrease in sample variability of both protein and oil would be desirable from a processor's perspective. More uniform soybeans with higher estimated processed values (EPV) yield more high protein soybean meal, and more pounds of oil for every bushel of soybeans processed (see Grain Quality Fact Sheet #39 for more information). However, our current statewide soybean sample size is too small to draw a conclusion that is representative for the entire state.

Analysis

A statistical analysis was performed on the data collected from the last four years using Statistical Analysis Software (SAS) to uncover differences between years and between districts within a year. All tests used an alpha of 0.05. District summary values for 1996, 1997, and 1998 can be found in Grain Quality Fact Sheets 31, 36, and 41 respectively. The results of the analysis are summarized in Tables G and H. In Table G, the years are statistically similar if they have the same letter, while in Table H; the districts with the same letter are similar within a year.

Yearly trends were apparent in the analysis of data. Statewide protein averages were significantly lower in 1999 compared to the other three years (Table G). All districts were statistically similar in protein content within each year (Table H). The NW and NC districts had the highest protein averages in 1996 and 1997, with the NC district having the highest average in 1996 with 37.5% followed by the NW district with a 36.8% average. In 1997, the NW district had the highest average at 37.7%, followed by NC having a 37.6% average. In 1998, the C district had the highest average with 38.3% followed by the EC district, whose average was 38.0%. The EC district had the highest average in 1999 at 35.9%, followed by the WC district with a 35.7% average. The EC and SW districts had the lowest protein averages two out of the four years. The EC district had the lowest protein in 1996 and 1997 with protein averages of 34.4% and

Oil content averages in 1996 and 1997 were significantly lower than the averages in 1998 and 1999 (Table G). In 1997, 1998, and 1999, all districts were statistically similar in oil content, while in 1996 the NW district was significantly lower and the SW was higher compared to all other districts (Table H). The SW district had the highest oil content average in 1996 (18.4%) and in 1998 (18.9%). The C district had the second highest average in 1996 with oil content values of 17.2% and 18.7% respectively, while having the highest average in 1997 (18.3%). The NW district had the highest average in 1999 (18.8%); however, the district had the lowest average in 1996 and 1997 with averages of 16.7% and 17.0% respectively. The NC district had the second lowest average in 1997 (17.1%) and the lowest average in 1998 with 17.8% average. The EC district had the second lowest oil average in 1996 and 1998 with averages of 17.2% and 18.0%, respectively while the WC district had the lowest oil content (18.2%) in 1999.

Statewide fiber averages were significantly similar in 1998 and 1999, while the 1996 average was statistically higher and the 1997 average was statistically lower (Table G). In 1997, 1998, and 1999, all districts were statistically similar in fiber content, while in 1996 the EC district was significantly higher compared to all other districts (Table H). The EC district had the highest fiber averages in 1996, 1998 and 1999 with values of 5.9%, 5.3%, and 5.5%, respectively. The NC district had the highest

Table E. Summary of 1999 Indiana Soybean Acres, Yield, and Production					
Districts	**Harvested Acres (1000's)**	**Acres per Sample**	**Yield (bu/ac)**	**Production (1000 bu)**	**Production (1000 bu) per Sample**
NW	767	109,571	40	30,871	4,410,143
NC	693	99,000	40	27,892	3,984,571
NE	568	568,000	33	18,860	18,860,000
WC	683	341,000	38	26,115	13,057,500
C	1,305	217,500	41	53,839	8,973,167
EC	553	553,000	40	22,257	22,257,000
SW	**693**	**0**	**34**	**23,708**	**0**
SC	199	0	24	4,806	0
SE	219	0	34	7,492	0
State	5,650	236,667	38	215,340	5,993,333
1998	5,600	155,555	41	235,200	6,533,333
1997	5,400	122,727	44	437,600	5,400,000
1996	5,360	145,559	36	203,650	5,657,773

Table F. Summary of 1999 Indiana Soybean Composition Survey
(13% moisture basis)

District	**Number of Samples**	**% Protein**		**% Oil**		**% Fiber**	
		Avg.	**Range**	**Avg.**	**Range**	**Avg.**	**Range**
NW	7	35.1	33.5-37.9	18.8	17.2-21.4	5.4	5.1-5.8
NC	7	35.0	32.9-37.6	18.6	17.7-19.7	5.1	4.7-5.3
NE	1	34.7	NA	18.7	NA	4.9	NA
WC	2	35.7	35.7-35.7	18.2	17.7-18.7	5.2	5.2-6.2
C	6	35.1	33.6-36.0	18.7	17.7-20.2	5.3	5.0-5.7
EC	1	35.9	NA	18.6	NA	5.5	NA
State	24	35.1	32.9-37.9	18.7	17.2-21.4	5.3	4.7-5.6
1998	36	37.5	34.3-40.3	18.2	17.0-19.7	5.3	4.8-5.6
1997	44	37.1	32.9-44.1	17.7	14.5-19.7	5.1	4.7-5.6
1996	36	36.6	31.3-42.9	17.5	15.5-19.3	5.8	5.3=6.2

Table G. Statistical Analysis Across Years			
	Protein	Oil	Fiber
1996	A	B	A
1997	A	B	C
1998	A	A	B
1999	B	A	B

Purdue University's Grain Quality Laboratory continues to offer composition analysis for whole

Table H. Statistical Analysis Across Districts Within a Year						
District	Protein	Average	Oil	Average	Fiber	Average
1996						
NW	A	36.8	A	16.7	A	5.7
NC	A	37.5	A,B	17.2	A	5.5
C	A	36.7	A,B	17.2	A	5.6
EC	A	34.4	A,B	17.1	B	5.9
SW	**A**	**36.2**	**B**	**18.4**	**A**	**5.6**
1997						
NW	A	37.7	A	17	A	5.0
NC	A	37.6	A	17.1	A	5.3
NE	A	37.1	A	17.3	A	5.1
WC	A	36.7	A	17.3	A	5.1
C	A	36.7	A	18.2	A	5.0
EC	A	35.4	A	18.1	A	5.1
SW	**A**	**37.2**	**A**	**17.9**	**A**	**5.3**
1998						
NW	A	37.7	A	18.1	A	5.2
NC	A	37.5	A	17.8	A	5.2
NE	A	35.9	A	18.6	A	5.2
WC	A	36.6	A	18.8	A	5.3
C	A	38.3	A	18.2	A	5.3
EC	A	38.0	A	18.0	A	5.3
SW	**A**	**36.5**	**A**	**18.0**	**A**	**5.3**
1999	.					
NW	A	35.1	A	18.8	A	5.4
NC	A	36.0	A	18.6	A	5.1
NE	A	34.7	A	18.7	A	4.9
WC	A	35.7	A	18.2	A	5.2
C	A	35.1	A	18.7	A	5.3
EC	A	35.9	A	18.6	A	5.5

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Grain Quality Fact Sheets can be accessed on-line through the World Wide Web at:
http://www.agcom.purdue.edu/AgCom/Pubs/grain.htm
(select) Grain Quality or http://pasture.ecn.purdue.edu/~grainlab
(select) On-Line Extension Publications (select) Grain Quality Fact Sheets Almanac:
send e-mail to: almanac@ecn.purdue.edu
message: send grain guide or send grain catalog or send grain factsheet #44 (for example) or
send acsonline GQ-44

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